Instructor
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Note: This syllabus is subject to change.

Website
This course makes extensive use of T-square. You are responsible for checking the website frequently for announcements. Quizzes, experimental procedures, and other important information will be posted on the site. Lab notebooks will also be maintained online through T-square. All assignments should be submitted through T-square. Unless otherwise specified, all assignments are due at 8:00 am the day of the lab.

Overview
You will explore fundamental aspects of cell biology and current methods used in the cell biology laboratory by developing a group research using the mouse macrophage cell line, RAW264.7, as a model system. We will perform four experiments to examine changes in cell morphology, proliferation and cell death, and gene expression in these cells in response to treatment with LPS, a bacterial endotoxin.

Course format
Each experiment will be performed over a three week period. During the first week, we will discuss the relevant concepts behind the experimental methods and questions to be answered by that method. You are expected to have the necessary procedures written out in full when you arrive in class the following week. During the second week, you will work in groups to carry out the experiment. During the third week, you will analyze the data and organize your results in preparation for writing your lab reports. Discussion of the next experiment will also take place at this time.

Laptops will be frequently required for this course, and you are encouraged to bring them every day.

Grading
Attendance and participation  5%
Groupwork evaluations  5%
Quizzes  10%
Lab Notebooks  10%
Lab Reports 1-3  30% (10% each)
Literature Review  5%
Independent Experiment Proposal  10%
Group presentation  5%
Final lab report  20%

Final scores will be rounded to the nearest whole number, and grades will be assigned according to the following scale: 90-100% A; 80-89% B; 70-79% C; 60-69% D; <60% F
Lab Safety and Personal Protection Equipment
Safety policies are mandated by federal, state, and institutional rules to keep everyone safe. Violation of safety policy will result in loss of all participation points for the lab in question. **Report all injuries or accidents to the TA or instructor immediately.** Safety glasses and lab coats must be worn in the lab during weeks we are conducting experiments. Lab coats must be purchased by students, and safety goggles will be provided. Shoes that completely enclose the foot must be worn at all times. During some laboratories, you will need to wear gloves (these will be provided). The following policies are non-negotiable, and failure to abide by them will result in removal and an unexcused absence from that day’s lab:

- You must wear shoes that cover your feet entirely (no sandals, etc).
- No food or drinks, including water bottles.
- No cell phone use, including texting (phones must be silenced and off the lab bench).
- Clean up your lab station at the end of lab and report any mess left behind from previous lab sections to your TA.
- Properly dispose of trash, glassware, and biohazard waste. Other people’s safety may be compromised by your negligence.
- During “wet labs” you must wear long pants to the ankle, your lab coat and goggles, and long hair should be tied back. Long pants are recommended for every lab.
- Follow additional safety procedures for specific lab activities as indicated by your TA.
- **Improper attire will result in loss of participation points for the day.**

Plagiarism and academic integrity
All students should be familiar with their rights and responsibilities under the Georgia Tech Academic Honor Code and are expected to abide by its provisions. Academic dishonesty is not a “victimless” crime; it interferes with instruction, damages the reputation of the Institute, and ultimately harms the perpetrator who fails to learn course material or appreciate the value of individual effort. Plagiarism and other violations of the Honor Code ([http://www.honor.gatech.edu](http://www.honor.gatech.edu)) will not be tolerated and can result in severe disciplinary action, up to and including expulsion. Prohibited conduct includes, but is not limited to: copying from another student or allowing someone to copy your work, using notes in any form on a quiz without the express permission of the instructor, requesting a re-grade of an assignment after altering it, submitting someone else’s work as your own, or allowing your work to be submitted under another person’s name. Note that sharing and discussing raw data when completing laboratory reports is permitted and encouraged (this is how science is really done!), but **submission of identical work is not permitted.** This includes all writing, figures, and any other form of student work. **When in doubt, ask your TAs or instructor whether an activity constitutes an Honor Code violation.**

Attendance
All students are expected to be present each week in lab. **This includes being on time.** If you do not provide the instructor with a valid Georgia Tech excused absence within 24 hours of missing a lab, your grade will drop by 5%. Excused absences will require appropriate documentation (i.e., physician’s note, letter from the Dean of Students, police report). Makeup work for excused absences will be assigned on a case-by-case basis and is typically due within one week. If you miss a lab, you are still responsible for completing assignments and getting data from your group members. Any requests for extensions on assignments require appropriate documentation as described above for excused absences.

Groupwork Evaluation
All students are expected to actively participate in bench-work and class/group discussions. A portion of your grade will be determined by peer evaluation throughout the semester, based on your contributions to your group’s lab work. You will evaluate your peers and yourself after each experiment and after the group presentations at the end of the semester using the online CATME tool. Peer evaluation scores will be part of your participation grade.
Assignments
This lab has assignments due regularly throughout the semester. **Unless otherwise specified, all assignments are due via T-square at 8:00 am the day of lab.** An assignment submitted at 8:01 am will be considered late. A late assignment can receive at most 50% credit if submitted within 2 days. **You are responsible for ensuring that your assignment was properly uploaded to T-square; any assignment emailed directly to the instructor or TAs will be considered late if it is received after the due date and time.**

eNotebooks
Lab notebooks will be maintained online through T-square. Prior to the lab, you are expected to discuss the purpose and hypothesis/es of the experiment in your online lab notebook. After the lab, you will add the methods (including any deviations from the pre-written protocol), results (including all data collected in both table and image form as appropriate), and conclusions. **You must write in your own words and create your own tables and figures.** Online lab notebooks will be assessed before and after each lab. Detailed information for preparing lab notebooks will be available on T-square and discussed in class.

Online Quizzes
Quizzes will cover the necessary background for you to perform and understand the experiment we will conduct that week. Quizzes will be based on both material discussed in class as well as material posted on T-square.

Written reports
After the completion of an experiment, each student will prepare a laboratory report. The report should include:
- Abstract: concise summary of the purpose of the experiment, hypothesis that was tested, and summary of results and interpretations.
- Introduction: a discussion of background material relevant to understanding the experiment.
- Materials and Methods: Concise summary of what you did (including how the cells were prepared and maintained prior to your work with them).
- Results: Include both figures and written results. Here you simply state what you saw.
- Discussion: Interpret your results and state why you observed what you did during the experiment.
- References: Citations made within the text and formatted in the style of a research journal.

Drafts of each lab report will be peer-reviewed in class by one other group member. Participation in peer review, including submitting a complete draft and reviewing a peer’s draft, is required for full credit on each lab report. Detailed information for lab report requirements will be available on T-square.

Literature Review
Mid-way through the semester, you will conduct a search of the scientific literature to compile sources appropriate for your proposed Independent Project. For each article, the literature review should include the full citation and a short summary of how the article applies to your proposed research topic. The instructor and TAs will provide feedback that should be taken into account to develop the Independent Project.

Independent Projects
At the end of the semester, you will prepare a grant-style proposal to investigate a biological question of your choice. The proposal must be based on recent primary literature and be possible to perform with techniques you have learned in this lab using RAW264.7 cells. All proposals will be anonymously evaluated by the class, and two proposals will be selected for completion as the final investigation in the lab.

Group Presentations
On the final lab meeting day, each group will lead the class through a discussion of the selected Independent Projects. This will include background, rationale, methods, results, and an analysis of what conclusions could be made from those results. The presentations may use Powerpoint, Prezzi, or other presentation formats. **The electronic portion of the presentation must be submitted via T-square by 11:00 am the day of the presentation.** Detailed information for the lab presentations will be available on T-square.
**SCHEDULE (subject to change)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lab #</th>
<th>Discussion Topics and Activities</th>
<th>Assignments and Quizzes*</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-Jan</td>
<td>1</td>
<td>Introduction to the cell biology laboratory Objectives and format Lab safety discussion Procedures used in cell culture and RAW 264.7 cells Lab skills and statistics exercise</td>
<td>Quiz 1: Statistics and Laboratory Skills and Cell Culture Exercise Bring laptops</td>
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<tr>
<td>16-Jan</td>
<td>2</td>
<td>Choose groups Experiment 1 preparation Cell culture exercise</td>
<td>Quiz 2: Experiment 1</td>
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<tr>
<td>23-Jan</td>
<td>3</td>
<td><strong>Experiment 1: Viability of LPS-treated RAW264.7 cells</strong> Assays: Trypan blue exclusion and WST-1 colorimetric assay Note: upload all Trypan blue exclusion data to Tsquare site at the completion of lab</td>
<td>Quiz 2: Experiment 1</td>
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<tr>
<td>30-Jan</td>
<td>4</td>
<td>Experiment 1 discussion and analysis Experiment 2 preparation Laboratory report discussion Reading: “Writing a Laboratory Report” Bring laptops Due @end of lab: Experiment 1 eNotebook</td>
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<tr>
<td>6-Feb</td>
<td>5</td>
<td><strong>Experiment 2, Part 1: Activation of RAW264.7 cells by LPS Assay: fluorescence microscopy</strong> Experiment 1 laboratory report peer review Quiz 3: Experiment 2, part 1 Due: Experiment 1 lab report DRAFT</td>
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<tr>
<td>13-Feb</td>
<td>6</td>
<td><strong>Experiment 2, Part 2: Effects of LPS on RAW264.7 cells</strong> Assay: flow cytometry Quiz 4: Experiment 2, part 2 Due: Experiment 1 lab report Due: Experiment 1 peer evaluation</td>
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<tr>
<td>20-Feb</td>
<td>7</td>
<td>Experiment 2 discussion and analysis Experiment 3 preparation <em>Meet in Cherry Emerson computer lab (room 206)</em> Reading: “Writing a Literature Review” Bring laptops Due @end of lab: Experiment 2 eNotebook</td>
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<tr>
<td>27-Feb</td>
<td>8</td>
<td><strong>Experiment 3, Part 1: Expression and activation of MMP-9 during LPS-induced activation</strong> Assays: qPCR and zymography Experiment 2 laboratory report peer review Quiz 5: Experiment 3 Due: Experiment 2 lab report DRAFT</td>
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<tr>
<td>6-Mar</td>
<td>9</td>
<td><strong>Experiment 3 gel analysis</strong> Experiment 3 discussion and analysis Literature Review discussion Due: Experiment 2 lab report Due: Experiment 2 peer evaluation Bring laptops Due @end of lab: Experiment 3 eNotebook</td>
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<tr>
<td>13-Mar</td>
<td>10</td>
<td>Literature review and proposal outline peer review Experiment 3 laboratory report peer review Due: Literature review Due: Experiment 3 lab report DRAFT</td>
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<tr>
<td>20-Mar</td>
<td>No lab</td>
<td>Spring Break – no lab</td>
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<tr>
<td>27-Mar</td>
<td>11</td>
<td>Independent project proposal study section Due: Independent project proposal</td>
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<tr>
<td>3-Apr</td>
<td>12</td>
<td>Preparation for Independent Projects: protocol design sheet and reagent preparation Due: Experiment 3 lab report Due: Experiment 3 peer evaluation Bring laptops</td>
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<tr>
<td>10-Apr</td>
<td>13</td>
<td>Independent proposal experiments Due: Independent proposal lab report Due: Independent project peer evaluation</td>
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<tr>
<td>17-Apr</td>
<td>14</td>
<td>Group Presentations and Discussion Course wrap-up Location TBA Due by 11 am: group presentation slides</td>
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<tr>
<td>24-Apr</td>
<td>15</td>
<td>Dead Week – no lab Due: Independent proposal lab report Due: Independent project peer evaluation</td>
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*Unless otherwise specified, all assignments are due by 8:00 am the day of lab*